DISCUSSION

It would appear that the power of the sympathetics to cause vasoconstriction beyond physiological requirement, has been the cause of several allied pathological entities. Thus, Heyman and, later, Herrmann and Caldwell have been successful in treating Sudeck's atrophy by perivascular sympathectomy. Further, Homans, as well as Ochsner and De Bakey, have shown remarkable results in sympathetic block for thrombophlebitis, which results have been substantiated in several cases at Fort Ord. And, finally, this relationship between vasoconstriction and Volkmann's ischemia, and even gangrene of an extremity, seems to be fairly well established. We were interested in the review of "Wounds in Modern War," by Colonel McFarlane, surgical consultant to the Canadian Active Service Force, reported in the *Bone and Joint Journal* and reproduced in our *Army Medical Bulletin*. In it he describes two cases of vasospasm in the lower extremity, both of which developed extensive gangrene of muscle, as described by Griffiths, and ended in amputation. After our study we agree only partly with his conclusion, that this is an alarming complication, and neither the etiology nor the treatment is sufficiently understood as yet.

CONCLUSIONS

Our experience with this group of allied vascular accidents has taught us some never-to-be-forgotten lessons. It has stimulated us to make the following resolutions in the handling of traumatic injuries of the extremities.

1. To carefully examine the limb for vascular and nerve involvement before and after reduction.
2. To look for evidence of arterial spasm either as an early or delayed complication of trauma.
3. To use spinal anesthesia whenever the patient's condition will permit.
4. To use lumbar sympathetic block (or stellate ganglion block) in all cases of circulatory impairment of the extremity.
5. To explore the major artery and perform either peri-arterial sympathectomy or arteriectomy if sympathetic block fails.

Station Hospital, Fort Ord.

REFERENCES

1. d'Harcourt, J., et al.: Closed Plaster Method of Treatment: Account of Its Use During Spanish War, Brit. Med. Jour., 1:652-654 (April 20), 1940.

2. Leriche, R., et al.: Arteriectomy: Follow-Up in Seventy-Eight Cases, Surg., Gyn., & Obst., 64:149-155, 1937.

3. Griffiths, D. L.: Volkmann's Ischemic Contracture, Brit. Jour. Surg., 28:239-260, 1940.

4. Foisie, P. S.: Volkmann's Ischemic Contracture, New Eng. Jour. Med., 226:671-679 (April 23), 1942.

5. Homans, J.: "Circulatory Diseases of the Extremities." Macmillan Company, New York, 1939.

—Vascular Disorders of the Extremities, New Eng. Jour. Med., 226:917-922 (June 4), 1943.

6. Gage and Ochsner: Ann. Surg., 112:938-959, 1940.

7. Trueta, J.: "The Principles and Practice of War Surgery." C. V. Mosby Company, St. Louis, 1943.

8. Child, C. G.: Noninfective Gangrene Following Fractures of the Lower Leg, Ann. Surg. 116:721-728 (Nov.), 1942.

9. Herrmann and Caldwell: Diagnosis and Treatment of Post-Traumatic Osteoporosis, Amer. Jour. Surg.

10. Ochsner and De Bakey: Therapy of Phlebothrombosis and Thrombophlebitis, Arch. Surg., 40:208-31 (Feb.), 1940.

11. McFarlane, J. A.: Wounds in Modern War, Jour. Bone and Joint Surg., 24:739-752 (Oct.), 1942. The Army Medical Bulletin, No. 65 (Jan.), 1943.

APPENDICIAL DISEASE

MAJOR WILFRED C. CURPHEY
MEDICAL CORPS, ARMY OF THE UNITED STATES
Fort Sam Houston, Texas

IT is estimated that sixteen thousand persons lose their lives each year in the United States as the result of appendicitis. This from a common and curable surgical disease. It is so commonplace, in fact, that it becomes almost boresome to discuss it further. Why, then, do we continue to be satisfied with such an appalling death rate, particularly when compared with that of other civilized countries? The fact is we are not satisfied at all with the situation; the result being that American surgeons have rushed into all sorts of ill-advised methods in an effort to control this problem. Years ago the fact that the disease was surgical became apparent, and this was followed by a long and tedious establishment of an acceptable surgical technique. During this time any abdominal pain led to appendectomy—a policy abused to the extent that many scathing articles began to appear in medical literature condemning this wholesale and unskilled surgery. Instead of correcting such surgical ills by controlling the many untrained operators, surgeons began to speculate whether or not appendicial disease should always be subjected to surgery. Since then delay and caution have gained importance, and many steps have been taken toward more scientific methods of handling the complicated cases of appendicitis. We are moving forward slowly and many times in circles, but still there is improvement, as attested by recent reports from the United States Public Health Registration Area.

TABLE 1.—*Deaths and Death Rates from Appendicitis in the Registration States of Continental United States: 1929-1939*†

Year	Number	Rate per 100,000 Estimated Population
1939	14,113	10.8
1938	14,300	11.0
1937	15,340	11.9
1936	16,480	12.9
1935	16,142	12.7
1934	18,129	14.3
1933	14,113	11.2
1932	16,766	14.1
1931	17,845	15.1
1930	17,798	15.2
1929	17,398	15.1

† From the Department of Commerce, Bureau of the Census, Washington.

* The opinions or assertions contained therein are the private ones of the writer and are not to be construed as official or reflecting the views of the War Department or the war service at large.

QUESTIONNAIRE

The question is whether this improvement can be continued, and also what are to be the next logical steps if ever we are to equal the records of other countries in handling this problem. In order to secure some answer to the many problems involved, the following questionnaire has been sent to several leading surgeons throughout the country:

"APPENDICITIS"

1. *Do you follow any definite rule regarding indications for immediate surgery or deferment of surgery in acute appendicitis?*
2. *Do you feel that surgery should be deferred in cases of ruptured appendix: if so, how long?*
3. *What clinical and laboratory findings do you depend upon in making a diagnosis of ruptured appendix?*
4. *What general routine do you follow in management of ruptured appendix?*
5. *Do you feel that suspected acute appendicitis should come to surgery in the absence of an absolutely positive diagnosis?*
6. *Do you feel that surgery is indicated during the interval in cases of recurrent appendicitis?*
7. *What is your attitude toward chronic appendicitis?*
8. *Do you feel that the mortality rates of appendicitis are improving in your community?*
9. *Do you feel that too much surgery is being done for questionable appendicitis?*
10. *In your opinion, are surgeons too greatly concerned about the problem of appendicitis?*
11. *Do you feel that the diagnosis of appendicitis is usually and definitely possible?*
12. *If operation is deferred in suspected appendicitis, what are the clinical and laboratory findings upon which you base your judgment in future observation of the case?*
13. *In your opinion, what is the most common error made in diagnosis and management of acute appendicitis?*

ANSWERS TO QUESTIONNAIRE

The answers to these questions will not be attempted here, but a discussion of the opinions expressed will be included with a summary of the recent literature and mortality statistics.

In the first place, there are, as always, two schools of thought regarding surgical treatment. The so-called conservative group, or advocates of the Ochsner method of treatment, and the radical group, or those sometimes referred to as ever-ready operators. And then there are those who, by honest effort, attempt to use their judgment in order to take advantage of the best parts of both policies. However, in order to use our best surgical judgment we must have some basic criteria or belief upon which to rely; and since we all are constantly using the best and most conscientious judgment at our command, it becomes apparent that those who adhere to the last-mentioned policy almost invariably conduct themselves in accordance with their basic principles. So we find that it is quite simple to segregate the exponents of this last group into one or the other of the two great schools of thought which is either radical or conservative in method.

This has been done arbitrarily, and those whose judgment usually leads them toward conservative treatment have been grouped accordingly, as has the inherently radical group. Therefore, we find two groups: first, all of those who advocate immediate surgery regardless of the stage of the disease (clinically) are classified as radical, while those who practice careful observation, with delayed surgery in cases of suspected rupture, are considered conservative.

It is evident that the conservative school of thought hold to the following concepts: as long as infection is confined to the appendix itself, the accepted and entirely satisfactory procedure is surgical removal of the disease as quickly as possible. Once the appendix is ruptured, as evidenced by findings which vary with the individual surgeon, elevation of temperature above, say 101 degrees, or increasing tenderness and rigidity or cessation of pain with recurrence over a greater area, are accepted as evidence of rupture. The trouble is no one is sure. All will admit that a small percentage of cases present the clear-cut picture. Also all admit that, even with the above findings, the appendix still might not be ruptured.

ON SURGICAL INTERVENTION: IMMEDIATE OR LATER?

It is a fact that the recognition of a ruptured appendix and the extent of the peritoneal soiling or the presence of an abscess is very frequently an extremely difficult clinical determination to make a point repeatedly admitted by a number of our most excellent surgeons. This is important, since the conservative group contend that as soon as rupture is present with peritoneal soiling a new factor is introduced. The infection is no longer confined to the appendix, but the peritoneum as a whole is potentially involved. That is, the house is on fire, so why take out the exploded stove and risk spreading the blaze? The patient is seriously ill and much less able to withstand surgery. Intervention may spread the infection further. Surgical trauma may promote paralytic ileus, as may the anesthetic; therefore, it is wise to defer operation, thus preserving the patient's powers, to localize the infection and develop an abscess which can be drained at a more opportune moment. There is some question as to the opportune moment and how it is exactly determined. However, the treatment proposed by A. J. Ochsner of nothing by mouth, strict bed rest, ice bags or hot packs to abdomen, morphia, and fluids by infusion or by vein, is to be carried out. More recently, of course, sulfanilamide or some related drug may be used.

The advocates of this plan all carefully insist that if the appendix has not ruptured, it must be removed at once. Some are willing to operate if the infection is still limited to a small area about the appendix, even after rupture. Most will operate after the infection is well localized into an abscess which can be drained without soiling the peritoneum, and defer appendectomy until the abscess is completely healed, possibly after a period of three months. Practically all surgeons are agreed concerning this last method of handling a well-established abscess, no matter how it has happened to exist, by accident or by conservative treatment.

Also, practically all surgeons will agree that to handle a case by the conservative method can be extremely difficult and mistakes in judgment are, like football fumbles, ever threatening and just as disastrous. It is not intended to imply that such a plan of treatment is absolutely fallacious, for many capable surgeons hold to it, and for good reasons; however, mortality statistics taken from the literature are recorded along with similar statistics with reference to cases handled by the radical or immediate intervention group (Charts 2 and 3), so that a comparison can be made.

The tenets of this latter group may be expressed briefly in the words of J. M. T. Finney: "It is always safe to be on the safe side. I have never regretted taking out an appendix, but I have, in times past, regretted not taking one out for one reason or another." Or in the words of J. Shelton Horsley, "While patients do not usually die within the first eight or nine hours from gastro-intestinal perforation—which a ruptured appendix is—they may acquire a fatal infection during this time unless there is prompt and proper treatment. It seems a good surgical rule to close a gastro-intestinal perforation as soon as possible." The following outline of treatment is, therefore, suggested by this group:

1. Immediate operation as soon as the diagnosis is made, no matter what the stage of the disease.

2. Physiological rest of the gastro-intestinal tract is effected by limiting the oral intake and avoiding proctolysis or any peristaltic stimulation. Essential water, electrolytes, and calories are given parenterally, controlling distention by continuous gastric lavage with suction.

3. Surgery is done with the least possible manipulation with or without drainage—drainage being another debatable problem.

SURGICAL PROCEDURES

The controversy over points in surgical technique will not be probed except to point out that most surgeons recommend the McBurney incision. Some always remove the appendix, others do if it presents itself readily or if there is no evidence of perforation. Most prefer to drain a well-established abscess and remove the appendix later. There are also those who have adopted the policy of closing the peritoneum in cases of peritonitis without drainage and, in general, the results have been satisfactory. When drainage is decided upon, most surgeons use some form of Penrose rubber tissue drain; however, Babcock objects to this type and recommends glass or alloy drains, contending that such materials cause much less peritoneal irritation, therefore allowing more complete drainage of the peritoneal cavity.

STATISTICAL SUMMARY

Tables 2 and 3 represent a summary of all cases of appendicitis reported in the literature during the past two years, concerning which enough information was available to permit completing the statistics for each group, namely, those treated by the conservative method and those treated by the radical or early operative method.

TABLE 2.—*Conservatively Treated Patients*

Number of Cases	Number of Deaths	Mortality in Per Cent
(a) Entire Group		
8,206	882	10.7
101 Nonsurgical		
8,307 Total number		
(b) Uncomplicated Cases		
4,602	37	.804
(c) Abscess Cases		
579	57	9.8
496		65.4*
Abscess with immediate surgery		14.3
(d) Peritonitis		
898	124	13.8
791		60.9*

* Indicates patients handled by rigid adherence to Ochsner method. Exact number of deaths not given.

TABLE 3.—*Radically Treated Patients*

Number of Cases	Number of Deaths	Mortality in Per Cent
(a) Entire Group		
11,793	242	2.05
(b) Uncomplicated Cases		
7,267	36	.49
(c) Abscess Cases		
786	45	5.7
(d) Peritonitis		
677	119	17.5

The mortality rates have been computed in each group: for all cases combined complicated or uncomplicated, for all uncomplicated cases, for cases with peritonitis, and for those with appendicial abscess. In the conservative group it was difficult to complete statistics for the last two classes, since authors usually reported statistics on the whole group, giving mortality rates on the operated cases combined with the conservatively treated cases.

COMMENT

To my mind, the results of the statistics are conclusive, and the answer must be that radical management of appendicial disease is the procedure of choice and should be adhered to. If there is any method of handling appendicial disease which does offer an improvement in present mortality rates, it is prompt and skillful surgery. The time has come for the medical profession to forsake our practice of exercising so-called judgment and to dedicate ourselves to a policy of immediate surgery in handling such cases. This does not mean that a patient's general condition is to be overlooked in the mad scramble to operate, or that every patient with an abdominal complaint has appendicitis, for it has been the wholesale surgery of former years which led primarily to the doctrine of delay. Perhaps it would be well to follow Doctor Hertzler's advice and wait until a qualified surgeon had arrived before surgery is attempted.

What is the most common error? The answer becomes obvious when we consider that among the group treated by the exponents of conservative methods, only .89 per cent mortality occurred when operation preceded any sort of complication. Likewise the cases reported by the radical exponents carry a mortality rate of .49 per cent if surgery is accomplished before complications have had time to occur.

In the first series the mortality rates skyrocket to a figure over ten times as great with rupture. In the second series, again rupture means more than ten times as many deaths in spite of the fact that here the mortality figures are about half as great as those reported by the conservative group. We must prevent rupture and complications if we are to prevent death from appendicitis. We all agree that many factors, such as virulence of infecting organisms, powers of resistance, etc., are powerful influences, but the one factor which can be controlled is time. It requires time for the pathogenesis of acute appendicitis to unfold from acute inflammation, to rupture, to abscess formation, if fortune is on our side and spreading peritonitis does not relieve us of our problem first. Many will subside without further ado if we wait, but who can tell which one? Also many will not rupture for several hours, but again who can accurately determine which one? Complicated appendicitis can be prevented by not allowing time to pass. All surgeons, but particularly the medical profession as a whole, must not delay, for this is, in the opinion of most of America's leading surgeons, the most common error in handling appendicial disease—delay. Such an opinion is expressed by Alton Ochsner when he says: "Although I am a staunch advocate of the conservative treatment of appendicial peritonitis (not appendicitis, because I do not believe there is such a thing as conservative treatment of appendicitis), I do feel that, if there is a question about perforation, it is better to operate even at the risk of backing out sometimes without removing the appendix than to overlook a ruptured appendix which is still leaking into the peritoneal cavity."

It seems quite clear, then, delay is the most common error in handling acute appendicitis. It is also the most inexcusable error committed. Among the conservative group, only 55 per cent of all cases came to surgery before rupture. The radicals managed to operate on only 61 per cent of their cases before rupture. Mont R. Ried believes that this delay results from three causes: delay on the part of the public to consult a physician, refusal to submit to surgery, and the gambling of doctors on the outcome of the disease. Our profession should never be reproachable for permitting appendicitis to advance to rupture. This does not apply to the inevitable mistakes in diagnosis, but to those of us who deliberately choose to gamble. Such activities can well be confined to vacations in Nevada and for much lower stakes.

In spite of all this, the profession can be held responsible for delay only indirectly. And that is that we have failed to impress the public with the importance of prompt action. In Sweden the death rate from appendicitis is less than 8 per 100,000 population each year, while in the United States it continues to be 10.8 per 100,000. This can be improved upon only if the profession insists upon continued and persistent education of the public.

IN CONCLUSION

In conclusion, it seems evident that immediate surgery in all cases of acute appendicitis offers the best ultimate prognosis, whether early in the disease or late. Since delay is the most common and most costly error in handing this common surgical emergency, it becomes the duty of the medical profession to eliminate this mistake. That this may be done, all physicians must be acutely aware of its importance and must actively endeavor to bring it to the attention of the public. It can easily be said that this has already been done, but only recently the cities of Philadelphia, Cincinnati, and Atlanta have realized a remarkable improvement in mortality rates from appendicitis as a result of an intensive public education campaign. The same should be done throughout the country. We must actively enlist the aid of public sentiment and knowledge, and not suffer the humiliation of having it forced upon us from other sources.

First Auxiliary Surg. Group.

Rh ANTIGEN: ITS CLINICAL IMPORTANCE*

CHARLES WEISS, M. D.
San Francisco

INTRODUCTION.—In 1937 Levine and Stetson[1] discovered a new agglutinable factor in human erythrocytes which is independent of the four blood groups and the antigens M, N, and P. Some time later (1941) Landsteiner and Wiener,[2] by immunizing rabbits with monkey blood (*Macacus rhesus*), described the factor Rh, which agglutinates 85 per cent of all human red cells. Levine and Katzin[3] quickly recognized the importance of this blood factor and applied this discovery to an understanding of the cause of certain intragroup transfusion reactions during pregnancy and the puerperium, of the pathogenesis of repeated miscarriages and neonatal deaths as well as some of the hemolytic anemias of the newborn. Levine and his collaborators[4-8] showed that a father who possesses the Rh antigen in his red cells may transmit this dominant Mendelian character to his offspring, who in turn may immunize the mother if she is lacking in this agglutinogen. Anti-Rh antibodies which pass from the mother's blood into that of the baby may damage the hematopoietic system and hemolyze the blood of the fetus with the production of jaundice, anemia or erythroblastosis.

This work has been confirmed by many investigators, including Mayer and Vogel,[9] Davidsohn and Toharsky,[10] Diamond,[11] Kariher and Spindler,[12] Javert,[13] Fisk and Foord,[14] and Boorman,

* From the clinical and research laboratories of the Mount Zion Hospital, San Francisco.

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